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ABSTRACT

This introduction to the major concepts of cost-benefit analysis (CBA) is intended for individuals involved in health care provider education who are attempting to measure the costs and benefits of their educational activities. After tracing the development of CBA, the paper defines it as an attempt to quantify and compare the expenditures for a project with the value of the finished project and identifies the ways information gained from CBA can be used. In addition, the paper looks at problems associated with the use of CBA, such as the difficulty in assigning dollar values to attitude changes, aesthetic values, and increased quality of life; the costs of the analysis; and the inability of CBA to take social and environmental effects into consideration. Next, a summary is provided of methods used to determine fixed and variable costs, and examples are cited of less expensive ways of providing health care training, such as cooperative programs, student self-training, the elimination of unnecessary units, and student-financed training. The following section of the paper looks at ways of determining direct, indirect, and long-term benefits, considering problems in evaluating revenue-producing services; citing possible assessment areas such as employee turnover and effectiveness of training; and reviewing a CBA of a physical fitness program as an example of setting objectives and determining benefits. A glossary of terms and bibliography conclude the paper. (AYC).

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AN OVERVIEW OF
COST-BENEFIT ANALYSIS FOR
EDUCATORS OF HEALTH CARE PROVIDERS

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INTRODUCTION

Part of the economic situation of the 1980's is the increasing concern for strict budgetary accountability. As each department of an institution develops its goals and determines the costs of meeting these goals, administrators are asking for justification for the expenses. Cost-benefit analysis (CBA) has been offered as a possible response to this request. This article is intended to aid individuals involved in the education of health care providers who are attempting to measure the costs and benefits of their educational activities by introducing the major concepts in CBA. For specifics on "how to do CBA" readers are referred to the articles listed in the bibliography. This article is divided into five sections:

1. An introduction which includes the background and some of the problems with cost/benefit analysis.
2. A summary of methods used to determine costs.
3. A summary of methods used to determine benefits.
4. A glossary of terms relating to economics and cost/benefit analysis.
5. A bibliography.

Cost-benefit analysis is a speciality of economics. While the use of CBA can be traced as far back as 1844, its popularity did not rise until the U.S. water programs of the 1930's that examined the costs of irrigation projects and the projected increase in farm output that would result from the projects (14). Today CBA is widely used in investment decision-making in governmental (particularly the Corps of Engineers and the Bureau of Reclamation) and public utility services such as transportation, communication, energy production, education and health. CBA has been so appealing that it is also being applied to small investment decisions and in fact it seems fashionable to do so (32). Health manpower training has joined in this trend as indicated by a number of recent articles on the application of CBA to health institution inservice education (see references).

In its most common usage, CBA is an attempt to quantify and compare the expenditures for a project and the value of the finished project to allow for systematic thinking in decision making. Traditionally, both the expenditures and the benefits are not only the monetary investments by and profits to the individual or enterprise producing the project, but also the societal cost and benefits (32). This societal consideration is why CBA has been used to justify large company projects to shareholders or governmental projects to taxpayers where concerns about negative

environmental or societal impacts are raised. In many cases, use of CBA is mandated by government regulation as the nation attempts to "require managers to be more accountable with public funds and provide data on the efficiency and effectiveness of service programs." (39)

Is CBA useful in institutional decision making concerning training in the health industry? Certainly the money invested is significant to warrant systematic thinking supported by CBA. In 1976 U.S. hospitals spent \$131 million on the orientation of nurses and \$91 million on their in-service education. This equals approximately \$1.00 per patient day (21). Thus training managers are controlling a significant portion of the hospital industries' resources and are responsible in part for the financial well-being of the enterprise.

The information gained from a CBA of a training program can be used in support of maintaining current needs and future expansion. In this period of economic hardship and retrenchment, training is often the first to be cut back. "As profits of a company go, so goes training," (12) and thus the inherent good of training or its ability to satisfy employees is no longer sufficient to obtain support. Rather, training must be shown to contribute to organization objectives. CBA puts the evaluation of a program in management terms and helps make it more acceptable to today's decision-makers (26).

CBA also provides assistance to the training manager. It forces close inspection of training programs to determine if institutional goals (benefits) are being met and how an educational experience may be contributing to meeting these goals. Discussed in the next section is how cost-benefit analysis allows for comparison of different instructional modes to determine which mode is the most beneficial at the least cost.

Terminology used in CBA is derived mostly from economics. A glossary is provided in this document to help acquaint those starting into the literature of CBA with the terminology. One seeming inconsistency is the use of the phrase "cost-benefit analysis". This phrase is the most commonly used title and commonly implies the ability to quantify costs and benefits in monetary terms and put them into a ratio. However, the ability to put many benefits into dollar terms is difficult if not impossible (8, 29, 32, 38, 47). Such elements as attitude changes, aesthetic improvements and increased quality of life are too elusive to assign dollar values but still should be included in decision making. This problem is found in the analysis of benefits from training health professionals (and will be discussed later) and has led to the use of the term "cost-effectiveness" which infers an analysis where the benefits are not all concrete. Another term, "cost-justification", is sometimes used when none of the benefits are quantifiable.

Cullen et al. (13) suggests that the term "cost" is negative because it infers a loss to company management. They substitute the term investment (time and money that will eventually pay off in helping the company). Also, they suggest use of the term "return" in place of benefit or effectiveness to encompass all possible gains from the investment.

Drawbacks to CBA must also be considered. First is cost of the analysis itself. Time must be spent to collect and compile data. A \$20 million dam project may justify \$20,000 spent on a CBA, but with small investments, the benefits in terms of cost savings from the program may be less than the cost of a complete analysis itself. However, model programs which are analyzed once and repeated additional times due to proven benefit or discontinued due to high cost compared to benefits, may warrant the inspection by a CBA. Also, certain assumptions can be made about the activity which can simplify the CBA. Examples of these will be given later.

Simplification of CBA alleviates some of the difficulty in using the data from a complicated CBA. The literature is filled with models involving mathematical formulas and statistics, yet only those persons who developed the models or use them daily can fully understand the significance of the results. Simplified methods of analysis are not only cheaper but may be easier for management to interpret.

Even in large scale social institutions, CBA is not always reliable. Jameson (20) found a dramatic failure of CBA in a large governmental department. He ascribed the failure to 1) inappropriate use of technique and misleading guidelines for its application, 2) dominance of organization interest over analytical requirements, 3) inappropriate staffing and support for analysis and 4) use of analysis as a tool in internal struggles. This suggests a full scale CBA should be done only by qualified persons with sufficient support and without pressures and negative influence from management.

The most condemning criticism of CBA has come in the area for which it was originally designed -- the consideration of social and environmental effects when undertaking a large project. Cousins (8) states that CBA "descends like a death sentence on any proposal that would apply creative imagination to socially essential programs or long-range goals . . . ; political decisions are governed not by human needs or by the dictates of conscience but by computer printout." Kelman (23) writes that "in areas of environmental, safety and health regulation, there may be many instances where a certain decision might be right even though its benefits don't outweigh its cost." Angus (2) so abhors the strict application of CBA that he created scenarios based on the determination of the cost of a human life.

Other criticisms include the lack of consideration of scientific serendipity that may be the part of a project but is totally

unpredictable (8). Also, CBA does not look at all situations equally -- e.g. \$600,000 to award scholarships may provide increased earnings to graduates but what benefits would be obtained if the \$600,000 was used to feed 50,000 Asian children?

These complaints do not necessarily rule out the use of CBA totally but rather suggest a tempering of its use. Facets of a project that are difficult or impossible to quantify should be considered seriously. Also, the type of thinking that goes into CBA is useful and has resulted in its use at least implicitly in most investment decisions. Passmore states "Attempts to specify, measure, and compare costs and benefits explicitly makes the decision making process available for review and critique" (29).

COSTS

Costs are usually divided into two groups -- fixed and variable. Fixed costs are those that will be constant regardless of the number of training programs or numbers of students in each program. Examples of fixed costs are salaries of full-time staff and facility overhead. Variable costs are costs that may change based on the size and nature of each project. Examples are consultant fees and instructional materials. It is useful to divide costs into these two groups for analysis of possible cost savings in a certain program. The ratio of variable to fixed costs can be revealing (47). As a guideline, a 2 to 1 relationship is ideal. If the ratio is much lower due to high fixed costs, an over-staffed, overequipped training department may be indicated. If variable costs are too low, too few participants are in the department offerings. If the ratio is high because fixed costs are low, the possibility of an ill-equipped or understaffed department exists.

The challenge is to collect information on the costs of all factors that enter into a particular event. The following is a list combined from several sources (7, 26) that will help in assuring a complete analysis:

A. Fixed Cost

1. Salaries, fringes and taxes of full-time staff (consider planning as well as implementation stage)
2. Rent, utilities and janitorial service for staff office space
3. Clerical assistance and supplies
4. Equipment

B. Variable

1. Training aids - all types of software (films, texts, handouts) and hardware rented for program
2. Rent, utilities, maintenance and security on space used for program
3. Consultant fees and travel
4. Guest faculty fees, travel, room and board
5. Printing and mailing costs of marketing materials and certificates
6. Refreshments
7. Release time for students
8. Evaluation time and materials
9. Unforeseen (margin)

Several of the cost factors in the list may be difficult to compute. Overhead (both fixed and variable) may not be obvious if it is contained within a large institution. Estimates may be made by obtaining the total overhead for the institution and taking a percentage of that figure that is based on the percent of institutional square footage taken up by the educational department.

Staff office area would be solely based on square footage but classrooms used at times by other departments would be based not only on square feet but also on the length of time the space was used for training. The percentage of institutional overhead taken for training may also be based on the salary expenditure for the department (direct labor costs) compared to the entire institutional salary costs.

If release time for students needs to be considered, supervisors should be asked if extra personnel, hours, overtime or compensation time are needed so cost can be calculated. However, it is possible that no extra expense is incurred by time away and thus no cost would result.

Often the benefit of a training program is not in question - the program must exist to teach needed skills or fulfill accreditation requirements. Thus analysis of cost in order to compare to benefit is not necessary. But cost analysis is still useful to determine what spending can be controlled or what other teaching methods may be less expensive to accomplish the same goal (38). Comparisons of predicted investments for different programs has resulted in the adoption of a new approach and a cost savings. The following are some examples of less expensive ways to do training that were adopted due to cost analysis:

1. Cooperative effort (10): Many institutions may be doing the same program with a few attendees. If the programs are rotated from place to place and students come from all the participating institutions, fewer programs with more students per program will result and drastically reduce cost. A disadvantage of this approach would be travel time between institutions and the coordination time involved in planning and implementation.
2. Training taken over by another institution: Colleges, universities, proprietary groups, etc. that do training have the staff, facilities and equipment already on hand for certain activities. With training activities that are not needed on a regular basis or not utilized by large numbers of students, educational institutions may be able to do the job cheaper. This is certainly true of lengthy educational programs for training new professionals but may also be true for short programs and continuing education. Costs at public colleges and universities are reduced due to the tax subsidies they receive. Disadvantages here are tuition expense, travel time, and the necessity to conform to the schedule of the institution offering the program. Also, control of course content is given over to another institution.
3. Students train themselves (22, 37, 42). Hardware and software for self-instruction have become commercially available on a wide scale. These can be used when the student has free time, thus removing release time cost.

Disadvantages are the initial cost of the equipment and materials, their upkeep, necessary replacement of outdated material and inability to customize the instructional material. The last problem can be overcome by creating your own software; however, this is time consuming.

4. Eliminate unnecessary units of training (5, 41): This assumes that a person may already be familiar with some of the material presented in a course. Using pretests, knowledge of each objective in the instructional program can be ascertained and students instructed only in those areas in which they are deficient. This type of individually packaged instruction is often combined with self-instructional materials to allow the greatest flexibility both in time and materials.

The major disadvantage of this "performance based staff development" is that the programs must have clear and complete objectives and the evaluation pre-tests must have criterion referenced questions. The development of these materials can be time consuming.

5. Students pay for the training (29, 41): Besides students directly paying tuition charges, indirect ways of shifting cost to the students are possible. Students may be paid less on the job until they complete training programs concerning needed job skills. Another mechanism is to require the completion of certain types of educational experiences for employment.

Programs for which the attendees pay lend themselves to a simple CBA based solely on benefits being the revenue from the tuition. Once fixed and variable costs are determined, a graph as shown in figure 1 may be constructed. The most significant point on the graph is the point where the total cost line crosses the revenue line. This indicates the number of paying participants needed to break even for the program. Below that point, cost outweighs benefits; above that point a profit is realized.

The disadvantage of student payment is that economically disadvantaged persons may be held back from advancement. Also, employer support of tuition is a benefit that has a high positive psychological impact on employees since it indicates desire on the part of the institution to improve its staff.

6. Make sure training is appropriate: Sovie (40) describes a situation where errors in medication delivered to patients resulted in the development of a medications course for nurses. However, upon closer examination the problem was found to be getting the correct order in the chart and administering the medication system. The problem was solved when the hospital switched from team

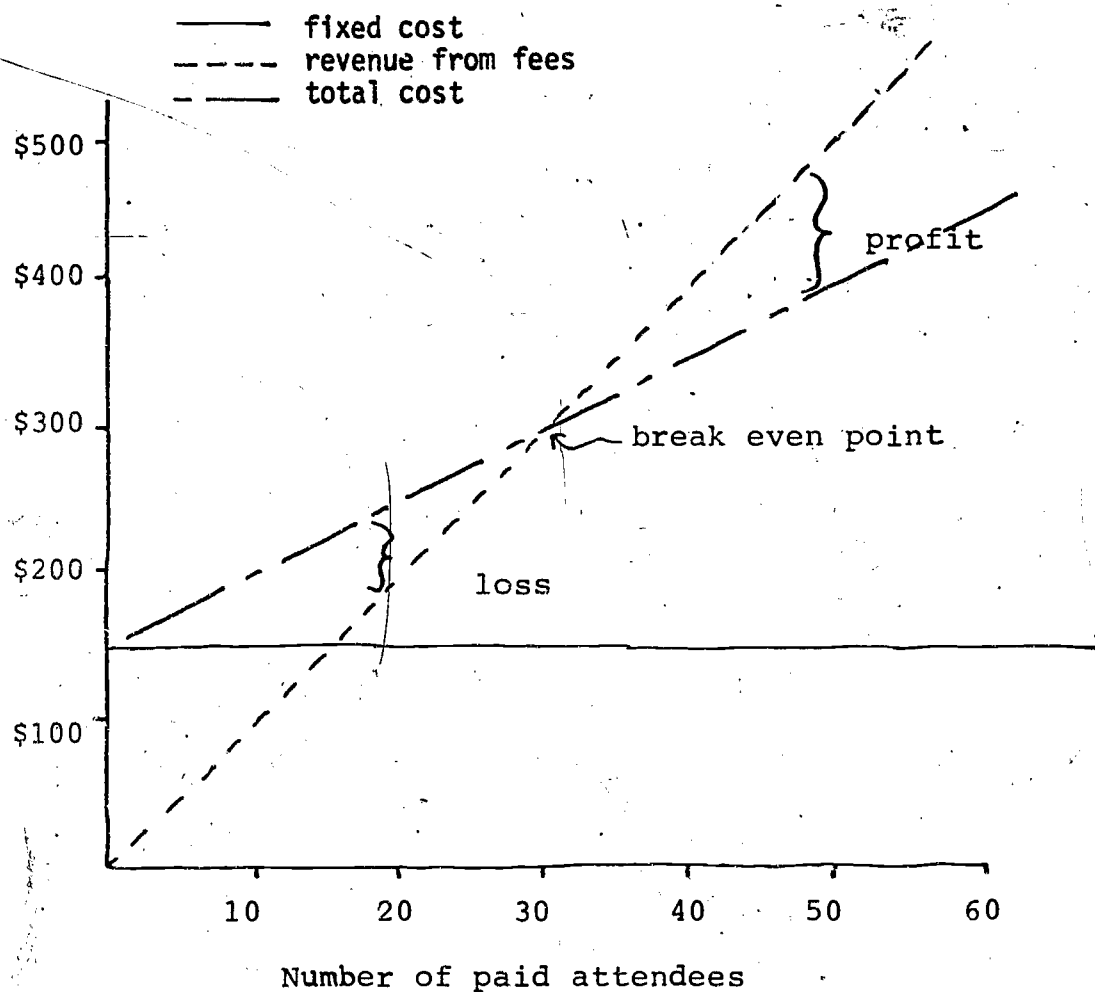


Figure 1. A graph for the determination of profit or loss on programs in which participants are charged a fee. The graph is based on each attendee paying \$10. (5)

nursing to an individualized system. Sovie points out that staff development is only a solution if

- a. a skill or knowledge is lacking
- b. other departments are doing their job (i.e. - no late deliveries)
- c. policy and procedure are adequate and implemented
- d. the problem is remedied when the positions involved are staffed by trained individuals

Thus money may be wasted if education is done when the problem is really a management deficit such as

- a. supportive services are making mistakes
- b. equipment and supplies are deficient or defective
- c. instructions or guidelines are unclear
- d. policies and procedure need revision
- e. "health provider does not recognize fully the performance expectations and contributions of each discipline for quality care" (i.e. doctors don't allow nurses to give instructions to patients).

Another method to assure appropriateness of training is the structuring of programs around problems brought to light by hospital audits (17). Audits allow the education to be based on actual statistics and, the effectiveness of the training can be monitored via changes in the audits after the program.

- 7. Use of in-house experts (15): A major cost in any training program is the salaries of the staff. If consultants, speakers, etc. are brought in, these expenses can become prohibitive. Use of persons currently on staff who have the knowledge and ability to instruct cannot only lower costs, but also yield a better response, since the attendees know the presenter and feel more relaxed and interested in the information.
- 8. No formal training at all: This may not be an option, but on-the-job training (OJT) has been done for years. Learning by experience is cost-saving and employees eventually master their jobs. Several studies have compared OJT and formal training at a technical school. An air force study (33) concluded that technical school training was more costly (\$2281 compared to \$1548 for OJT) yet 60% of the supervisors could not detect any difference in performance and of those supervisors who found a difference

there was an even split as to which type of training was better. Another study (12) found the cost of formal training to be the same as OJT (cheaper if done in large groups) and job skills were mastered faster and with higher competence by the formally trained group. Thus the cost savings of formalized training varies but maintains the advantage to being more consistent and controllable than OJT.

Other alternatives to reduce training costs have been suggested for industry (29) e.g. recruiting already trained individuals, relaxing requirements for quality of the workforce, or relocating to an area where better trained workers are found. These options may be possible for non-service institutions, but seem impractical for health care.

BENEFITS

Measurement of benefits in monetary terms contains many more complexities than measurement of costs. An article by Monat (26) contains a list that begins to demonstrate the variety of possible benefits which could be gained from training programs in an industrial situation. Examples of items from that list are as follows:

1. Money gained or saved by increased profit due to lower labor use; decreased operating supplies use, reduced costs of employee insurance, taxes and benefits, fewer errors and defects, decreased raw materials use, less cost reduction pressure, and a decrease in attitude that people are less important than sales or profits.
2. Money gained or saved by increased productivity due to faster order response, more efficiency, increase production, and a decreased attitude that "production is obtained at any cost" and "employees are a means to an end".
3. Money saved by increased quality of work due to decreased warranty cost, decreased recall cost, fewer complaints from customers, more defects caught by inspectors, lower defect/error rate, fewer rejects and less of an attitude that "quantity is more important than quality".
4. Money saved by better use of personnel resulting in fewer slow downs/stoppages; fewer walkouts, fewer strikes, increase level of technical competence, lower accident frequency and severity rate, better development and utilization of employees, better decision making, a belief that effort is rewarded, better perception of what the job is and how it is done, fewer quits and discharges, increased feeling that goals are achieved, less transferring, better suggestions, fewer grievances, less absenteeism, tardiness, and higher job satisfaction, group cohesiveness, morale and cooperation.

From this list it is obvious that benefits can be accrued in a wide variety of ways. Besides the above classification, another approach lists benefits as follows (32):

1. Direct -- changes in employee performance, such as, decreased waste and increased production.
2. Indirect -- decreased demands on supervisors and other employees.
3. Subsequent (long-term) - i.e. improved level of ability in persons presenting themselves employment.

What is left out of both of the above are benefits to society as a whole (externalities). These are factors such as improved industrial relations, increased versatility of the workforce, de-

creased crime, increased health, more jobs opening up as workers move up (32), desirable behaviors, increase in non-job related consumption (hobbies, etc.) equity in distribution of employment, higher values and a feeling of well-being (29).

The societal benefits are the hardest to quantify. Can a money value be placed on a feeling of well-being? Attempts to do so have been made by surrogate pricing (32). In this method persons are asked what dollar amount they would pay to have a certain intangible in their lives improved i.e., a better view or cleaner air. Average values are then used in the CBA. Another approach is shadow pricing in which values are assigned based on best judgment or estimate not related to market values.

More commonly, intangibles are not given dollar values but simply listed for consideration (32). Thus if a program cost \$50,000 and measurable benefits are \$45,000 plus intangibles, the manager must make a decision based on a "grey" area. A decision that benefits outweigh cost could be made even if the dollar amounts of tangible benefits were less than cost. Since CBA is a decision making tool, its usefulness is still present since all factors were considered.

* When doing a CBA of a health institution training program, rarely are all the possible benefits measured as they are in a large government project. To do so would require time and money that could possibly negate any savings produced by the training. In fact many of the comprehensive analyses described in the literature were done with the support of grant money and serve as model projects. To be more practical, many cost-benefit analyses of training programs are simplified and measure one or several important benefits that could be used to justify the program.

The easiest type of benefit to evaluate is an increase in revenue producing services (9, 30) e.g. x-rays, blood tests, or respiratory therapy procedures. The charge for each procedure is easily obtained and increase in number of procedures after training can be acquired from departmental logs.

Problems encountered in the evaluation of revenue producing services are as follows:

1. Separating human contributions from technical or other factors (32). For example, if persons were trained to use a new piece of equipment and their output increased after training, was it the training that was responsible or the equipment or both? A control group that had no formal training with the equipment but learned on their own (from manuals etc.) would be needed to make a clearer distinction.
2. Separating the actions of one group of workers from another group in a continuous process (32). For example, the number of procedures done by an employee may increase

not because of training he received, but because samples are delivered faster or in better condition by another employee.

3. Eliminating other factors in pre- and post-behavior monitoring (32). Seasonal changes, management changes etc. may alter output independent of training.
4. Measuring the life of the training investment (32). The increase in output accrues over some length of time. How long a time depends on other changes in equipment and personnel that occurs.

Decreased employee turnover has also been measured as a benefit (9, 19, 47). One estimate is that 300 to 700 times the hourly rate is spent to replace a worker (11). This might include lost production, recruiting costs and orientation. One study (36) considered how bicultural training seminars for new nurse graduates could save the hospital money due to increase retention and reduced orientation costs required for new employees. The results indicated that the seminar did reduce turnover and therefore more money was saved because of the need for fewer orientations than was spent conducting the seminar. The problem in analyzing employee turnover is in the ruling out of other factors not related to training such as management changes or decreased mobility of the work force due to economic conditions. The use of a control group which does not receive the training would be necessary to rule out these questions.

In a service industry like health care, benefits are often difficult to quantify because they are not immediately obvious. Health care may extend a patient's life as a benefit. Therefore if a training program for 20 nurses causes each to give better care for 5 years, the result is 100 years of better care. If 50 patients are cared for per year by each nurse then 5000 patients receive better care and if the better care increases life expectancy by 10 years the final result is 50,000 years of improved quality of human life (43). Impressive figures, but the numbers are difficult to substantiate.

A more common approach is to determine the effectiveness of a program by evaluating the knowledge, skills and attitude changes acquired by the participants and assuming the final result will be an improved quality of life for the patient. This type of analysis is not monetarily quantifiable and makes a traditional CBA impossible, but still provides information for intelligent management decisions.

Del Bueno (7) has ranked effectiveness of training into five categories. The lowest level of evidence is attendance only. The second level is an increase in awareness and/or acquired knowledge, skills and values. The next level of effectiveness is reached if the participants apply their acquired knowledge in a simulated setting. The fourth level is based on evidence that the

knowledge is applied in the real world with external reward and reinforcement. The highest level assumes application and maintenance of knowledge in the real world without external reinforcement. Del Bueno then uses these levels in comparison to measured costs to come up with ratios of cost effectiveness.

How is acquisition and application of knowledge determined? The most common approach to the evaluation of acquisition and application of knowledge involves pre- and post-testing of trainees (4). Knowledge acquisition testing is the most common. True-false, fill-in, multiple choice, etc. questions written specifically to the objectives (criterion referenced) are used on pre- and post-test. The improvement in the scores is the index of effectiveness (34). Some studies follow up the post-test with a second test months later to examine retention (14).

Increased skills ability can also be done in a pre-test/post-test manner in a simulated setting using mannekins, mock equipment set ups, etc. The use of a computer-monitored patient simulator in one study enabled the instructors to create trouble conditions and observe and correct common procedure errors (28). The same study indicated that students who did well on paper and pencil knowledge tests did poorly on the patient simulator.

Application of skills in real life has been tested via observation and reporting. Naturalistic observation described by Schinke and Wong (35) requires 2 observers to watch the interactions of a staff member with a client and rate 29 different types of behavior as positive, negative or neutral in response to client behavior which is positive, negative or neutral. This observation is performed for 4 hours in 2 pre- and post-test visits done at the same time of day. This type of testing is expensive, requires specially trained persons as observers and creates a certain amount of anxiety. Therefore it may be impractical for routine use.

Reporting, another method of evaluation, is of two types: supervisor and self. This method involves questionnaires requiring responses from the supervisor (who serves as a "naturalistic observer") or the employee about his job performance. Again these can be given as pre- and post-evaluations and the difference between the two used as the indicator of effectiveness. Supervisor reporting requires the willingness of the supervisor to participate and be objective. Self-reporting requires honest and objectivity from the trainee. Both would need to be administered several months later to evaluate retention.

Examples of evaluation questions used in self-reporting taken from a study by Anderson (1) are as follows:

1. Do you believe the application of Clinical Instructor Training Techniques has shortened the time needed to train employees in your area of responsibility?

2. Do you believe the application of Clinical Instructor Training Techniques has helped out the cost (sic) in your area of responsibility?
3. Do you believe the application of Clinical Instructor Training Techniques has improved employee morals in your area of responsibility
4. Do you believe the application of Clinical Instructor Training Techniques has reduced employee turnover in your area?

Another study (39) used activity reports to attempt to analyze benefits. Participates in the training program kept logs of client-related work and non-client related work (paperwork) and productivity measured before and after the training.

Benefits such as improved attitude or job satisfaction have also been evaluated via questionnaire. One study (34) used an attitude checklist in which mental health workers indicated their feelings before and after training towards patients who were relaxed, withdrawn and hostile, aggressive, intelligent or conduct problems. A job satisfaction rating was obtained by using checklists of terms ranging from very positive to very negative and describing different aspects of their job (34).

The most universally used method of evaluating the effectiveness of a training program is the follow-up questionnaire in which the participant is asked to evaluate the usefulness of the program to his job position. These questionnaires are simple, quick and serve as evidence that a training program has value.

The analysis of a physical fitness program by Pyle (31) serves as an example of setting objectives and determining benefits to be evaluated by one company. The goals were divided into three groups. The first were short term -- 3-4 months. These included physiological improvements such as pulse rate, blood pressure, cholesterol level, and oxygen uptake. All of these improvements were easily measured before and after the training. Lifestyle questionnaires were used to determine decreases in coronary risk factors of participants. Short term benefits are most significant to the trainees, not the company, but give a first indication the program is working.

Intermediate goals (1 year) included decreased absenteeism among participants and an increase in morale, self-confidence, and self-image. These goals were measured by psychological tests. Intermediate benefits are not only good for the participant but also the company.

The last group of benefits were long-term. These benefits are reaped 3-5 years after the training and are the most difficult to measure due to other factors besides training that might be involved. However, long term benefits make good arguments for

continuing a type of training. The anticipated long term benefits were a decreased use of medical insurance, decreased personnel turnover and increased productivity of the company.

Another example of benefit analysis in a cost-benefit study is the evaluation of the usefulness of students at a clinical site. A study of clinical training of occupational therapists was done by Chung (9). He used man hours in revenue producing work as his benefit objective. Logs were filled out by students and instructors to determine how much time was lost by the clinical instructor due to presence of students, and how much revenue producing time was contributed by students. The average result was that students contributed 83.1% more man-hours than the agency lost. The results of a questionnaire on student productivity administered before the project are interesting. They showed that students thought they increased productivity by 41%. Clinical instructors estimated an increased productivity of 17% and administrators felt students decreased productivity by 25%. This indicates clearly the pitfalls of subjective questionnaires for benefit evaluations. Even in the time logs (used for the same study) which should have been objective, clinical instructors recorded 2.1 times more hours for clinical instruction than the students recorded that they received.

GLOSSARY

The following are some of the terms used in the literature dealing with cost-benefit analysis. As in any technical field, understanding the jargon means you are half the way to understanding the concepts. The following list is an aid to that understanding.

Average product of labor - total product divided by the number of workers.

Benefits - the positive results of an institutions activities that are acquired by either the institution or society. Usually these results are quantifiable in monetary terms (38).

Cost - the investment in money and time an institution must make to create a certain product (goods or service).

Criterion - any measure of desired outcomes, results or performance (26).

Direct costs - expenses that are present only because of a specific activity. These are sometimes divided into labor and materials costs (see indirect cost).

Economics - the study of how men and society choose, with or without the use of money, to employ scarce productive resources to produce various commodities over time and distribute them for consumption, now and in the future, among various people and groups in society (29).

Effectiveness - the positive results of an institution's activities that are acquired by either the institution or society. Usually these results are not quantifiable in monetary terms (38).

Evaluation - process or set of activities comparing results against goals and established criteria (26).

Explicit cost - capital and labor resources necessary to deliver services that are usually part of budget accounting (24) (see implicit cost) All direct cash payments for factor inputs

Externalities - extra cost or benefits to society from the production or consumption of goods and services (24).

Fixed cost - costs that do not vary in the face of changing time, number of students or program development (13) (see variable cost).

Hardware, instructional - shelf items purchased to facilitate training program (i.e. film projectors, tape recorders, computer terminals) (13).

Human capital - the capacity of an individual to produce goods and services (29) or just labor.

Implicit cost - a cost that is not part of accounting process (i.e. costs to society due to a person becoming a student and withdrawing from the work force) (24) (see explicit cost) also called opportunity cost -- what must be given up.

Index - a ratio or number indicating a relationship between variable or sets of data.

Indirect costs - expenses incurred that are associated with a program but would exist even if that specific program was dropped (i.e. administration, facilities, full-time faculty); these are sometimes divided into labor and materials cost.

Initial cost - start up expenses for equipment salaries, etc., first time needs (36).

Marginal or margin - rate of change of a factor (i.e. unit change of benefits gained by the input of a certain unit of cost) (24).

Microeconomics - study of economics of individual decision units, i.e. the consumer, the household, the firm; the way these units interrelate to determine the relative prices of goods and factors of production and quantities of these which will be bought and sold. Provides understanding of the mechanism by which the resources possessed by society are allocated among alternative uses. The central concept is the market (29).

Overhead - costs of operating the physical plant of an institution - the fixed cost.

Product - activities or goods that are the output of an institution. In health care, patient improvement is the most common product.

Proportional cost - a type of variable cost that is directly related to the size of the project (i.e. a manual for each student) (43).

Recurrent cost - expenses that occur each time a program is offered, usually a variable cost (36).

Return - financial repayment of an investment.

Shadow pricing - a guess or estimate of a cost not necessarily based on market demands.

Software, instructional - shelf items of instructional content that are purchased to facilitate the training program (i.e. manuals, slides, film strips) (13).

Spillovers, social - see externalities.

Step cost - an expense that may remain fixed up to a certain point of production, then increase and remain fixed until production reaches another higher point (i.e. addition of an extra classroom if more than 30 persons attend a program) (43).

Sunk cost - money already spent on a project (hardware) (43).

Surrogate price - an estimate of the value of a benefit based on surveying those who might reap the benefit to determine what they might pay for the benefit.

Total costs - variable costs plus fixed costs.

Variable cost - those costs that vary as the time, number of students or development of a program change (13).

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